Companion Modelling to Support Adaptive Watershed Management in Northern Thailand Highlands

The resource management context

•The decentralization of land management provides an opportunity for local communities to increase their participation in decision-making.

•But concrete situations are complex in a highly heterogeneous and variable environment and problems involve many stakeholders with differing interests.

•Research should propose innovative participatory methodologies and tools enabling stakeholders to collectively define, understand, and discuss key problems, and to identify agreed-upon and adapted solutions.

The study site: land use dynamics and a soil degradation problem

•In Akha village of Mae Salaep, following 25 years of integration into the market economy, the former swiddening system is being replaced by semi-permanent, cash cropping-based agriculture. Horticultural production is playing a key role in this diversification

•An increasing risk of soil erosion on steep slopes perceived by lowlanders is a major source of conflict with highlanders. But there is still a need to elucidate the relationship between crop diversification and soil erosion.

Research objectives

•To generate a collective learning process to better understand this key interaction between agroecological and socioeconomic dynamics at different scales,

•To stimulate dialogue among concerned stakeholders (different farming households, local institutions, researchers) to achieve a shared representation of the problem,

•To facilitate the emergence of a common agreement on possible ecologically sound and socially equitable solutions.

Companion Modelling for iterative collective learning

•Companion Modelling (ComMod) is an innovative approach combining role-playing games (RPG) and multi-agent systems (MAS) for collective management of renewable resources (http://cormas.cirad.fr/en/networks/ComMod)

•Two successive ComMod cycles were implemented (Fig. 1) in this experiment.

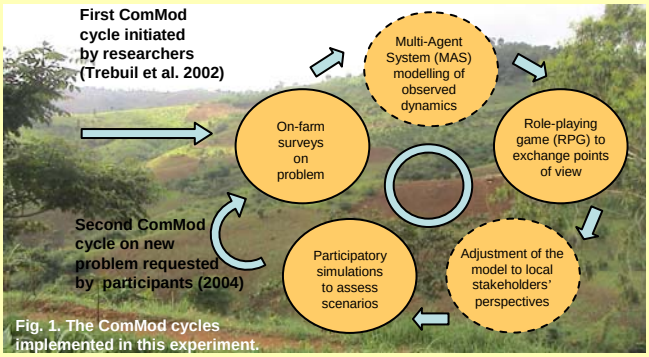

Fig. 1. The ComMod cycles implemented in this experiment.

•The RPG played by the stakeholders is a simplified version of the multi-agent model. The game helps them to understand and criticize the model.

•Individual interviews are conducted to elucidate the participants' behaviour during gaming sessions, to assess the learning effects of the game, and to validate the model.

•The validated MAS model is used for collective explorations of possible scenarios for the future.

Outcomes of the first ComMod cycle: stakeholders request a shift in focus

•Farmers validated the agroecological features and dynamics of land degradation proposed by the researchers. They considered that the expansion of perennial crops is a promising solution, both ecologically and economically.

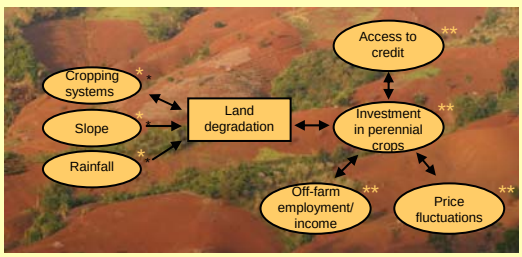

Fig. 2. The shift in focus from agroecological to socioeconomic aspects of land degradation between the two ComMod cycles. NB: * Aspects validated in the first ComMod cycle. ** Focus of the second ComMod cycle.

•Therefore, they requested to focus on the socioeconomic dynamics related to their adoption (Fig. 2). They also raised a social equity problem as the possibility to invest in perennial crops is related to access to credit.

Second ComMod cycle: a new conceptual model

•A complementary farm survey was carried out before conceiving a new model and its associated RPG (Fig. 3).

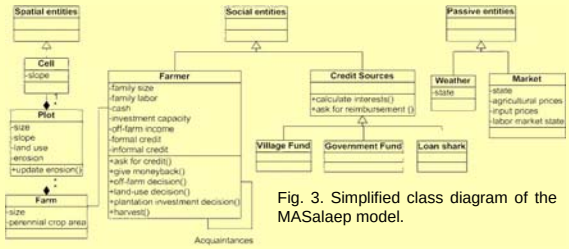

Fig. 3. Simplified class diagram of the MASalaep model.

•In the model, formal credit is mainly accessible to well-off farmers but it is partially redistributed via informal loans within social networks. Because those networks are quite small and homogeneous, smallholders are often excluded from both formal and informal systems.

•Green tea, the "perennial crop of the poor" (no inputs, stable prices) recently introduced on the farms, was inserted in this model.

•A labor constraint was also introduced as perennial crops are less labour-intensive than annual crops and allow more off-farm employment.

Gaming for stimulation of exchanges and emergence of scenarios

•A morning session was played according to the rules set up by the researchers (Fig. 4). This highlighted social inequity regarding investment in plantation crops and stimulated discussions among the players.

•Two scenarios were suggested to solve the problem.

Fig. 4. Gaming board and spatial interface of model

•They were played and simulated as shown in Fig. 5. Only the modified formal credit system allows an increase in plantation crops on small farms.

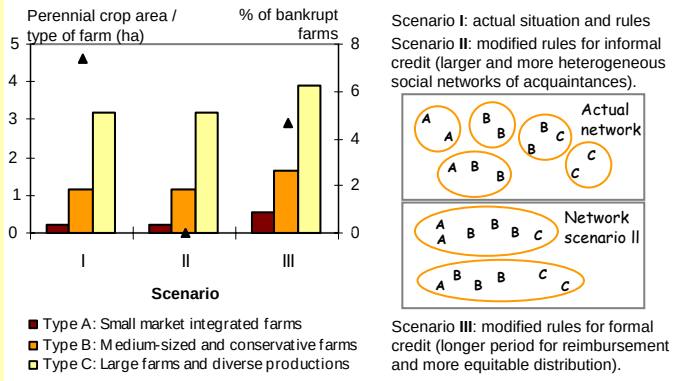

Fig. 5. Simulations of scenarios.

Lessons and perspectives

•"In the game, we can think together," said a player. The participants better understood each other's circumstances and could define collectively a desired situation to be reached.

•They improved their understanding of the complex system through experimental learning and were able to identify scenarios towards such a desired situation. "The players can try ways to invest in plantations by themselves," said another farmer. "This is more efficient than speaking." The experiment also "helps to think in advance" as players can observe several cropping seasons and the effects of their choices over a gaming session or simulation.

•The flexibility of the tools and the modellers' will to adjust them to stakeholders' changing preoccupations are essential for successful learning.

•A third ComMod cycle could include the tambon (subdistrict) administration officials, a key stakeholder in the decentralization process, "so that they will know what is happening in the village," said a villager. This institutional linkage is needed to strengthen collective initiatives at the village level.

Reference

Trebuil G., Shinawatra-Ekasingh B., Bousquet F., and C. Thong-Ngam. 2002. Multi-Agent Systems Companion Modeling for Integrated Watershed Management: A Northern Thailand Experience. In: Landscapes of diversity, X. Jianchu and S. Mikesell (eds), Yunnan Science and Technology Press, China. 349-358.

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